momentum	p	kg m/s	Vector (same direction as velocity)
Mass	m	kg	Scalar
Velocity	$\vec{v}$	m/s	Vector
Impulse	Δp	kg m/s	Vector
Change in $\vec{v}$	$\Delta \vec{v}$	m/s	Vector
Force	F	N	Vector
Contact time	Δt	s	Scalar

- v_f = Final velocity m/s vector
  v_i = Initial velocity m/s vector

Sign Conventions

Right is positive

Left is negative

$\Delta v = v_f - v_i$ $\begin{cases} v_i = 20\ m/s \\ v_f = 0 \end{cases}$

$0 \ominus 20\ m/s$

$= -20\ m/s$ Left

$20\ m/s$ Left

①

$\Delta P = ?$

$m = .17\ kg$

$v_f = -38\ m/s$ Left

$v_i = 0$

$\Delta v = v_f - v_i$

$= -38\ m/s - 0$

$\Delta v = -38\ m/s$

② $\Delta P = m\Delta v$

$\Delta P = (.17kg)(-38\ m/s)$

$\Delta P = -6.46\ kg\ m/s$ Left

$\Delta P = 6.46\ kg\ m/s$ Left

(2)

$v_i = ?$

$m = .42\,kg$

$\Delta P = 8.4\,kg\,m/s$ Right

$v_f = 0$

$\Delta P = m\Delta v$

$$\frac{+8.4\,kg\,m/s}{.42\,kg} = \frac{.42\,kg(\Delta v)}{.42\,kg}$$

$+20\,m/s = \Delta v$

$\Delta v = v_f - v_i$

$$\frac{+20\,m/s}{-1} = \frac{0 - v_i}{-1}$$

$v_i = 20\,m/s$ Left

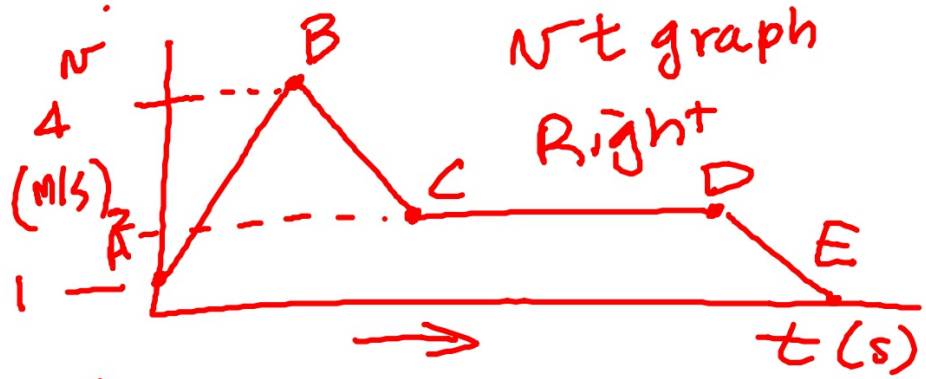
v_i 20 m/s Left

$20 = -v_i + v_i$

$+v_i = 0$

$-20 = -20$

v_i



v t graph

Right

What is momentum @ B?

50 kg = m P = ? $P = mv$

v = 4 m/s $= (50\text{kg})(4\text{m/s})$

$= 200\text{kg m/s}$ Right

What is the impulse from B to C?

m = 50kg $\Delta P = m\Delta v$ $(50\text{kg})(-2\text{m/s})$

$v_i = 4\text{m/s}$ $\Delta v = v_f - v_i$ $\Delta P = -100\text{kg m/s}$

$v_f = 2\text{m/s}$ $\Delta v = (2 - 4)$ 100kg m/s Left

$\Delta v = -2\text{m/s}$

(3) $\Delta P = ?$

$F = W = 530\,N\downarrow$

$\Delta t = .75\,s$

$\Delta P = F\Delta t$

$= (530\,N\downarrow)(.75\,s)$

$\boxed{\Delta P = 397.5\,kg\,m/s\downarrow}$

④ $m = ?$

$\Delta v = 7.5$ m/s NORTH

$\Delta p = 33.75$ kg m/s NORTH

$\Delta p = m \Delta v$

$$\frac{33.75 \text{ kg m/s N}}{7.5 \text{ m/s N}} = \frac{m(7.5 \text{ m/s N})}{7.5 \text{ m/s N}}$$

$\boxed{m = 4.5 \text{ kg}}$

NO DIRECTION

5. $\Delta t = 2\ s$

$\Delta p = -1470\ kg\ m/s$

$F = ?$

$$\Delta p = F \Delta t$$

$$\frac{-1470\ kg\ m/s}{(2\ s)} = \frac{F\ (2\ s)}{(2\ s)}$$

$$F = -735\ N$$

$F = 735\ N$ Left

(6.) $\Delta P = -1470\ kg\ m/s$

$v_i = ?$

$m = 1200kg$

$v_f = 0$

$\Delta P = m\Delta v$

$$\frac{-1470\ kg\ m/s}{1200\ kg} = \frac{(1200\ kg)\Delta v}{1200\ kg}$$

$\Delta v = -1.23\ m/s$

$\Delta v = v_f - v_i$

$-1.23\ m/s = 0 - v_i$

$\Rightarrow v_i = 1.23\ m/s$ Right

(7) RANK FORCE IF $m + \Delta v$ are CONSTANT

↓ TELLS me that the IMPULSE is CONSTANT

$\Delta P = \underbrace{m\Delta v}_{\text{CONSTANT}}$

set $\Delta P = 1$

$\Delta P = F\Delta t$

$1 = F\Delta t$

$F = 1/\Delta t$

A) Tile floor $\Delta t = .25s$

B) SOFA $\Delta t = 1s$

C) PACKING Peanuts $\Delta t = .75s$

D) WOOD FLOOR $\Delta t = .35s$

E) LAWN $\Delta t = .65s$

A D E C B

Highest ____ ____ ____ ____ Lowest

(8)

The BOWING of the plexiglass will INCREASE the CONTACT Time; Decreasing the FORCE OF The object.